

REMARKS

It is noted in the outstanding Office Action: (a) that claims 1-21 are allowed, (b) that claims 22-23 are rejected on various grounds, and (c) that certain objections have been raised regarding the specification and abstract. In the response herein, a substitute abstract is submitted, the issue concerning the specification has been addressed, certain of claims 1-21 have been amended as shown in the Listing of Claims and discussed herein, claims 22-23 have been cancelled and replaced by new apparatus and method claims 24-50 which are discussed below.

A. Rejection as to Form of the Abstract

In regard to the specification, a new Abstract is submitted which is believed to be in conformance with all requirements.

B. Rejection Concerning Antecedent Basis for Term "Topography"

The first rejection of method Claims 22-23 under 35 U.S.C. 112, second paragraph, states that there is insufficient antecedent basis for the limitation of "the topography" in line 4. The exact phrase objected to in Claim 22, in line 4 is "a. defining the topography of said mold surface."

A review of the original specification shows on page 11, lines 5-7, the statement: "The topography of the desired shape is initially defined by a physical mold, mandrel or plug or by a computer generated simulation of the desired shape which is subsequently formed into a physical mold."

It is respectfully submitted that the statement quoted above from the specification is substantially the same as and therefore provides an appropriate antecedent basis for the phrase in Claim 22, line 4, questioned in the Office Action and for references to "topography" in other claims.

C. Rejection of Claims Based on Prior Art

It is noted that claims 1-21 are allowed, and that the only claims that are rejected are Claims 22 and 23. In regard to the allowed claims 1-21 certain of these claims have been amended as to form, merely to improve clarity with no substantive change, as follows.

Claims 2 and 5 clarify that the "portions of tape not contacted by the pressure contact rollers" occur because of a "gap" between adjacent ends of said rollers.

Claim 6 is amended to change dependency to claim 2.

Claim 8 originally stated that the arms are "length-extendable" and attached to ends of the rollers. This amendment merely states more clearly that the rollers are angularly displaceable when the arm length is extended.

Claim 9 is amended to change dependency.

Claim 14 merely redefines "configuration" as "angularly displaceable orientation" of said side rollers. In substance the amended text is the same as before.

Claims 16 and 17 merely rearranges text so that "pair of cutters" has a proper antecedent.

Claims 20 and 21 merely substitutes "unit" for "sub-assembly" to render this text consistent with "unit" in Claim 1 on which it is dependent.

D. Rejected Claims 22 and 23

The only rejected claims, Nos. 22 and 23, are rejected under 35 U.S.C. 103(a) as being unpatentable over the Stone Patent. As will be discussed below, it is respectfully submitted that claims 22, 23 and new method claims 41-51 are all patentably distinguishable over Stone.

(1) First difference between Claim 22 and the Stone Patent

In Claim 22, part (c) includes a dynamic suspension system that urges pressure contact rollers (of said contact roller module) to push against said mold surface with substantially the same force at all times regardless of the changes in topography of the mold.

The Stone patent is cited as disclosing all the elements of Claim 22; however, we find a number of essential elements missing.

Claim 22 includes pressure contact rollers, whereas Stone has a non-rolling shoe 46.

Claim 22 urges the pressure rollers to push against the mold surface, whereas Stone draws the tape by friction without the shoe pressing against the mold. Then a separate compaction roller 62 presses the tape (col. 7, lines 53-60).

(2) Second difference between Claim 22 and Stone

Part (c) of Claim 22 recites: "providing a dynamic suspension system which urges said pressure contact rollers . . . to push . . . with substantially the same force at all times regardless of the changes in topography of the mold." This means maintaining substantially the same force regardless of variations in the mold surface shape from the path programmed in the robot for movement of the contact roller module; (and this is achieved by the unique spring force feedback suspension system of this invention). Stone has no such function or structure to achieve such function. Also, the Stone tape dispensing shoe has no integral angulation or spring feed-back features as are included in certain preferred embodiments of the present invention.

(3) Third difference between Claim 22 and Stone

The rejection states that Stone discloses all steps of Claim 22, except for omission of "the word fabrication". The rejection continues, "However, it would have been obvious to a person of ordinary skill in the art to take into account the tape laying machine of Stone as factory/industry equipment for fabrication, this accountability would have been a perfect choice for Stone's machine, thereby recognizing the functionality and the use of the fabric tape laying system."

The Examiner appears to be saying that while Stone teaches primarily an apparatus and method for accurately positioning and tensioning tape in a tape laying machine, and Stone does not specifically teach fabricating a structure, that it would be obvious to use the teaching of Stone for the apparatus and method of Claim 22. This argument is respectfully traversed because:

a. Stone focuses on problems of accurate web placement, web stretching, errors due to eccentricities of the web introduced by the take-up reel, initial placement errors, and proper tensioning of the web during placement,

b. Stone et al. includes no disclosure, awareness or concern for the problem considered with the new invention, such as constant force and tension applied to the tape when applied over varying topography, or accuracy in applying the tape to the mold when the mold topography varies from the programmed path followed by the module. Without such focus, Stone et al. could not solve these problems addressed by the present invention and could not be reasonably modified to do so, and

c. whether or not Stone et al. is applied for fabrication as opposed to mere coating, Stone still does not meet the claims, as numerous required elements are missing, as discussed above.

E. New Apparatus Claims 24-39

The above-mentioned allowance of original apparatus claims 1-21 indicates approval of the basic concept of the present invention. Within the scope of this concept we have proposed new apparatus claims 24-39 which define with greater specificity various embodiments of this invention.

F. New Method Claims 40-50

New method claims 40-50 describe and define the embodiments of the present invention, with focus on a) the new combination of a tape dispensing head with a spring pressure force feedback suspension system, and b) the further combination of a tape dispensing head with a new cutting unit for cutting and profiling one or both edges of the tape as it is directed to the mold, and c) a still further combination of a tape dispensing head with both dynamic suspension system and tape cutting or profiling unit.

Certain relevant aspects of the new tape dispensing head and suspension system combination, both as an apparatus and a method as they are included in the claims,

are now discussed.

The new tape dispensing head is attachable to a robot which typically means it is attached to the robot's face plate, with the contact pressure rollers offset from said robot (from said face plate) a predetermined distance to the surface of the roller (tool center point or TCP) where the roller engages and presses the tape onto the mold. The robot has programmable control means which is programmed to lay-up tape (for example, composite tape or fabric) along a predetermined three-dimensional path defined by x, y and z coordinates (local coordinates) that define a mold surface representing a predetermined surface shape or topography of an airplane wing or a boat hull or other object.

The invention utilizes a mold having a surface topography corresponding to, but which may have certain local variations from, said predetermined programmed shape defined in the robot's control means.

A principal object herein is to have the pressure rollers of the roller contact modules apply a predetermined pressure within a specified range onto said tape as it is applied or laid-up onto the mold, regardless of variations in contours in the mold surface different from the programmed path of the module as directed by the robot's control means.

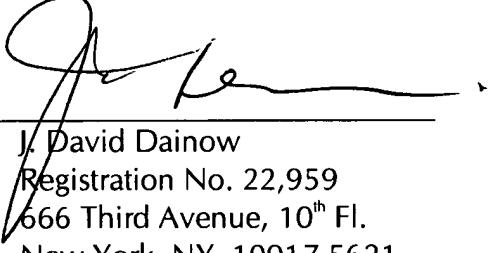
This is accomplished by the new suspension system which: a) allows every roller of every module freedom of displacement and/or angulation to conform to said variations in the mold surface, and b) applies a spring force of predetermined value or a predetermined range of values to every roller of every module, regardless of said displacement and/or angulation of such roller away from the programmed path of the module. Such displacement and/or angulation may be toward or away from the mold as its contour changes, while maintaining the predetermined offset of the pressure contact rollers from the robot's face plate.

The manner in which the new suspension system functions is to apply a spring force of substantially the same level of force to every roller in a direction generally perpendicular to the surface of the mold at every point along said predetermined path. Said spring forces may be from mechanical springs, hydraulic pistons or electronic devices. The spring means are carried by the module and attached to and thus move with each roller.

With this new system the tape can be laid-up more rapidly and more accurately and with greater integrity of attachment at a far lower cost than with any prior system.

In view of the amendments discussion herein, it is believed that all the pending claims are in condition for allowance, and reconsideration and favorable action are respectfully requested.

Respectfully submitted,
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